SITE: Carrier Air
BREAK: 7.4
OTHER: v.2

EnSafe

Environmental and Safety Designs, Inc.

5724 Summer Trees Drive • Memphis, Tennessee 38134 • Telephone 901-372-7962 • Facsimile 901-372-2454

November 20, 1997

Ms. Beth Brown
Remedial Project Manager
EPA Region IV
Atlanta Federal Center
100 Alabama Street, S.W.
Atlanta, GA 30303-3104

**Re: Carrier Air Conditioning Superfund Site**
**Collierville, Tennessee**
**Third Quarter 1997, Progress Report**

Dear Ms. Brown:

On behalf of the Carrier Corporation, EnSafe, Inc. is pleased to submit the following progress report for the third quarter of 1997. The report presents results of quarterly sampling of groundwater monitoring wells and Water Plant 2, as well as results of the Main Plant Area and North Remediation Site soil vapor extraction systems.

If you have any questions or comments, please do not hesitate to call me at (901) 372-7962.

Sincerely,
**EnSafe, Inc.**

Darrell Richardson

By: Darrell Richardson

Enclosure

cc: Mr. Nelson Wong, Carrier
Mr. T.R. Wood, Bechtel
Mr. Bill Gephart, TDEC
Mr. Terry Williams, Town of Collierville

# THIRD-QUARTER 1997 PROGRESS REPORT

## CARRIER AIR CONDITIONING
## COLLIERVILLE, TENNESSEE

**EnSafe Project Number: 1048-063**

**Prepared for:**

**Carrier Corporation**
**97 South Byhalia Road**
**Collierville, Tennessee 38017**

**Prepared by:**

**EnSafe, Inc.**
**5724 Summer Trees Drive**
**Memphis, Tennessee 38134**
**(901) 372-7962**

**November 20, 1997**

## Table of Contents



## List of Tables



## List of Appendices

## 1.0 INTRODUCTION

This progress report outlines actions and activities undertaken at the facility pursuant to the Unilateral Administrative Order for Remedial Design and Remedial Action (RD/RA). The report describes all work planned for the next quarter and includes all plans, reports, activities, and procedures completed during the previous quarter for groundwater and soil remediation at the Carrier Collierville site.

## 2.0 GROUNDWATER

### 2.1 Groundwater Sampling Methods

Groundwater samples were collected September 23 and 24, 1997 as outlined in the *Groundwater Remedy Design Report* from existing monitoring wells (MW) 31, 58, 60, and 62; the east and west Collierville wells; and from the effluent of Water Plant 2 (WP2).

MW-60 was purged of approximately 3 gallons of water pumping between 0.6 and 0.8 liters per minute. Temperature, pH, conductivity, and turbidity measurements stabilized during well purging. The well was sampled at the same pumping rate of about 0.6 liters per minute.

MW-62 was purged of approximately 5 gallons. A flowrate of approximately 0.7 liters per minute was maintained during the purging process, while water quality measurements of temperature, pH, conductivity, and turbidity were recorded. Once the water quality parameters stabilized the well was sampled at the same pumping rate.

MW-58 was purged and sampled using a previously installed bladder pump. The pumping rate was maintained at approximately 1.0 gallons per minute. Once the water quality parameters stabilized, the well was sampled through a dedicated sample port.

MW-31 was purged and sampled using a disposable bailer. The well was initially bailed dry and allowed to recharge before samples were taken.

Effluent samples from WP2 were obtained through a sampling port installed to allow samples of treated groundwater (after air strippers). East and west Collierville wells were sampled through sample ports located at each well.

## 2.2 Groundwater Analytical Results

Samples were submitted to Southwest Laboratories of Oklahoma, Broken Arrow, Oklahoma for the analysis of volatile organic compounds (VOCs) by USEPA-SW846 Method 8010, and lead and zinc were analyzed by USEPA-SW-846 Method 6010. Sampling protocol was followed on all sampling points as outlined in the *Groundwater Remedy Design Report, Appendix A, Performance Standards Verification Plan.*

Table 1 summarizes the results for chemicals of concern. The complete data summary tables are presented in Appendix A at the end of this report.

**Table 1**
**Groundwater Analytical Results - September 23 and 24, 1997**
**(in micrograms per liter)**

| Parameter | MW31 | MW58 | MW60 | MW62 | East Well | West Well | After Stripper |
|---|---|---|---|---|---|---|---|
| Trichloroethene | 21 | 5U | 5U | 5U | 96 | 180 | 2J |
| 1,2 Dichloroethane | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| trans-1,2 Dichloroethene | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| Tetrachloroethene | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| Chloroform | 5U | 5U | 5U | 5U | 5U | 5U | 5U |
| Vinyl Chloride | 10U | 10U | 10U | 10U | 10U | 10U | 10U |
| Lead | 252 | 0.9U | 0.9U | 0.9U | 7.1 | 0.9U | 0.9U |
| Zinc | 9730 | 12.6B | 5.8U | 6.4B | 7.9B | 9.7B | 29.5 |

***Notes:***

U Undetected below contract required quantitation limit
J Estimated quantity
B The result is less than the reporting limit but greater than the detection limit

## 2.3 Water Plant 2 Operation

The Town of Collierville wells continue to operate at a combined average of about 750 gallons per minute. As determined in *TECHNICAL MEMORANDUM, Site Downgradient Monitoring Well Data Quality Assessment*, dated August 12, 1994, this pumping rate is adequately containing groundwater contaminated with TCE.

During the third quarter of 1997, WP2 had treated approximately 97 million gallons of water. Based on analytical results from production wells, this equates to approximately 112 pounds of TCE removed during the quarter. Calculations can be found in Appendix B.

## 2.4 Planned Fourth-Quarter 1997 Activities

All wells listed above will be sampled again during the fourth-quarter 1997 as part of groundwater monitoring activities.

## 3.0 SOIL

## 3.1 Main Plant Area (MPA) SVE System

### 3.1.1 Operation and Maintenance

The average vacuum generated by the blower was 100 to 110 inches of water. Flowrates averaged 25 cubic feet per minute (cfm) for the shallow well manifold, and 35 cfm for the deep well. Carbon in both vessels was changed on September 30, 1997.

### 3.1.2 Analytical Results

Data collected during this quarter include shallow well manifold and deep well samples taken before carbon. Results of this quarter sampling are summarized in Table 2.

**Table 2**
**MPA SVE Manifold Analytical Data**

| Manifold I.D. | Sample Date | TCE (µg/L) |
|---|---|---|
| Shallow | 07/09/97 | 400 |
| Shallow | 08/07/97 | 170 |

During this quarter, approximately 50 pounds of TCE were removed from the shallow extraction wells. Pounds removed were calculated from a best fit line equation based on actual data. Graphed data can be found in Appendix B.

### 3.1.3 Planned Fourth-Quarter 1997 Activities

The system will be left to operate with only the shallow vertical wells open, and will be sampled monthly for carbon performance and TCE removal. The horizontal galleries will be operated and sampled each quarter during dry periods.

## 3.2 NRS SVE System

### 3.2.1 Operation and Maintenance

The NRS system is currently operating with both shallow and deep wells open with a combined flowrate of 175 cfm. Discharge temperatures range from 160 to 180 degrees Fahrenheit. The system has operated continuously since last quarter.

### 3.2.2 Analytical Results

Vapor samples are obtained from the system quarterly from the shallow manifold, deep manifold, and combined manifold lines. TCE results from the past four quarters are shown in Table 3.

**Table 3**
**NRS SVE Analytical Data**

| Sample Date | Shallow Manifold TCE (ug/L) | Deep Manifold TCE (ug/L) | Combined Manifolds TCE (ug/L) |
|---|---|---|---|
| 12/10/96 | 117 | 2.26 | 17.4 |
| 03/04/97 | 135 | 3.61 | 26.1 |
| 06/30/97 | 219 | 4.39 | 27.4 |
| 10/04/97 | 221 | 9.28 | 34.1 |

Approximately 15 pounds of TCE were removed by the NRS during this quarter. Removal of TCE calculations are similar to those described for the MPA system, and can be found in Appendix B.

### 3.2.3 Planned Fourth-Quarter 1997 Activities

The SVE system will continue to be operated continuously. As described in the previous progress report, a more aggressive approach will be taken to expedite remediation of the shallow soil zone. The approach will involve shutting off the deep well manifold and allowing the deep wells to act as passive venting wells to help alleviate stress on the vacuum blower. This approach will be

employed now that the ambient temperature is lower.

# APPENDIX A

# GROUNDWATER ANALYTICAL DATA SUMMARY TABLES

## SAMPLE DESIGNATION FOR MONITORING WELL SAMPLING

| | |
|---|---|
| **CARG310997** | ***Monitoring Well 31 Sample*** |
| **CARG580997** | ***Monitoring Well 58 Sample*** |
| **CARG600997** | ***Monitoring Well 60 Sample*** |
| **CARG620997** | ***Monitoring Well 62 Sample*** |
| **CARGAS0997** | ***After Stripper Sample*** |
| **CARGEW0997** | ***East Well Sample*** |
| **CARGWW0997** | ***West Well Sample*** |
| **CARGTB0997** | ***Trip Blank*** |
| **CARHWW0997** | |

# CARRIER, COLLIERVILLE
## CARRIER, RD/RA MONITORING, 9/97



| HAL VOA | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SAMPLE ID ------> | CAR-G-3109-97 | | CAR-G-5809-97 | | CAR-G-6009-97 | | CAR-G-6209-97 | | CAR-G-A509-97 | | CAR-G-EW09-97 | |
| | ORIGINAL ID -----> | CARG310997 | | CARG580997 | | CARG600997 | | CARG620997 | | CARGA50997 | | CARGEW0997 | |
| | LAB SAMPLE ID ---> | 31176.04 | | 31176.01 | | 31176.02 | | 31176.03 | | 31176.05 | | 31176.07 | |
| | ID FROM REPORT --> | CARG310997 | | CARG580997 | | CARG600997 | | CARG620997 | | CARGA50997 | | CARGEW0997 | |
| | SAMPLE DATE -----> | 09/24/97 | | 09/24/97 | | 09/23/97 | | 09/23/97 | | 09/24/97 | | 09/24/97 | |
| | DATE ANALYZED ---> | 10/08/97 | | 10/08/97 | | 10/08/97 | | 10/08/97 | | 10/08/97 | | 10/08/97 | |
| | MATRIX ----------> | Water | | Water | | Water | | Water | | Water | | Water | |
| | UNITS ----------> | UG/L | | UG/L | | UG/L | | UG/L | | UG/L | | UG/L | |
| CAS # | Parameter | 31176 | | 31176 | | 31176 | | 31176 | | 31176 | | 31176 | |
| 74-87-3 | Chloromethane | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U |
| 74-83-9 | Bromomethane | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U |
| 75-01-4 | Vinyl chloride | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U |
| 75-00-3 | Chloroethane | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U |
| 75-09-2 | Methylene chloride | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 75-35-4 | 1,1-Dichloroethene | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 75-34-3 | 1,1-Dichloroethane | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 67-66-3 | Chloroform | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 107-06-2 | 1,2-Dichloroethane | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 56-23-5 | Carbon tetrachloride | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 75-27-4 | Bromodichloromethane | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 78-87-5 | 1,2-Dichloropropane | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 79-01-6 | Trichloroethene | 21. | | 5. | U | 5. | U | 5. | U | 2. | J | 96. | |
| 124-48-1 | Dibromochloromethane | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 75-25-2 | Bromoform | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 127-18-4 | Tetrachloroethene | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 108-90-7 | Chlorobenzene | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 156-60-5 | trans-1,2-Dichloroethene | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 110-75-8 | 2-Chloroethyl Vinyl Ether | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U |
| 75-69-4 | Trichlorofluoromethane | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U | 5. | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U | 10. | U |

# CARRIER, COLLIERVILLE
## CARRIER, RD/RA MONITORING, 9/97



| HAL VOA | SAMPLE ID ------> | CAR-G-TB09-97 | CAR-G-WW09-97 | CAR-H-WW09-97 |
|---|---|---|---|---|
| | ORIGINAL ID -----> | CARGTB0997 | CARGWW0997 | CARHWW0997 |
| | LAB SAMPLE ID ---> | 31176.11 | 31176.06 | 31176.10 |
| | ID FROM REPORT --> | CARGTB0997 | CARGWW0997 | CARHWW0997 |
| | SAMPLE DATE -----> | | 09/24/97 | 09/24/97 |
| | DATE ANALYZED ---> | 10/08/97 | 10/08/97 | 10/08/97 |
| | MATRIX ----------> | Water | Water | Water |
| | UNITS ----------> | UG/L | UG/L | UG/L |

| CAS # | Parameter | 31176 | | 31176 | | 31176 | |
|---|---|---|---|---|---|---|---|
| 74-87-3 | Chloromethane | 10. | U | 10. | U | 10. | U |
| 74-83-9 | Bromomethane | 10. | U | 10. | U | 10. | U |
| 75-01-4 | Vinyl chloride | 10. | U | 10. | U | 10. | U |
| 75-00-3 | Chloroethane | 10. | U | 10. | U | 10. | U |
| 75-09-2 | Methylene chloride | 5. | U | 5. | U | 5. | U |
| 75-35-4 | 1,1-Dichloroethene | 5. | U | 5. | U | 5. | U |
| 75-34-3 | 1,1-Dichloroethane | 5. | U | 5. | U | 5. | U |
| 67-66-3 | Chloroform | 5. | U | 5. | U | 5. | U |
| 107-06-2 | 1,2-Dichloroethane | 5. | U | 5. | U | 5. | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5. | U | 5. | U | 5. | U |
| 56-23-5 | Carbon tetrachloride | 5. | U | 5. | U | 5. | U |
| 75-27-4 | Bromodichloromethane | 5. | U | 5. | U | 5. | U |
| 78-87-5 | 1,2-Dichloropropane | 5. | U | 5. | U | 5. | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5. | U | 5. | U | 5. | U |
| 79-01-6 | Trichloroethene | 5. | U | 180. | | 180. | |
| 124-48-1 | Dibromochloromethane | 5. | U | 5. | U | 5. | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5. | U | 5. | U | 5. | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5. | U | 5. | U | 5. | U |
| 75-25-2 | Bromoform | 5. | U | 5. | U | 5. | U |
| 127-18-4 | Tetrachloroethene | 5. | U | 5. | U | 5. | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5. | U | 5. | U | 5. | U |
| 108-90-7 | Chlorobenzene | 5. | U | 5. | U | 5. | U |
| 156-60-5 | trans-1,2-Dichloroethene | 5. | U | 5. | U | 5. | U |
| 110-75-8 | 2-Chloroethyl Vinyl Ether | 10. | U | 10. | U | 10. | U |
| 75-69-4 | Trichlorofluoromethane | 5. | U | 5. | U | 5. | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10. | U | 10. | U | 10. | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10. | U | 10. | U | 10. | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10. | U | 10. | U | 10. | U |

# CARRIER, COLLIERVILLE
## CARRIER, RD/RA MONITORING, 9/97



| METAL | | SAMPLE ID -------> | CAR-G-3109-97 | CAR-G-5809-97 | CAR-G-6009-97 | CAR-G-6209-97 | CAR-G-A509-97 | CAR-G-EW09-97 |
|---|---|---|---|---|---|---|---|---|
| | | ORIGINAL ID -----> | CARG310997 | CARG580997 | CARG600997 | CARG620997 | CARGA50997 | CARGEW0997 |
| | | LAB SAMPLE ID ---> | 31176.04 | 31176.01 | 31176.02 | 31176.03 | 31176.05 | 31176.07 |
| | | ID FROM REPORT --> | CARG310997 | CARG580997 | CARG600997 | CARG620997 | CARGA50997 | CARGEW0997 |
| | | SAMPLE DATE -----> | 09/24/97 | 09/24/97 | 09/23/97 | 09/23/97 | 09/24/97 | 09/24/97 |
| | | DATE EXTRACTED --> | 10/09/97 | 10/09/97 | 10/09/97 | 10/09/97 | 10/09/97 | 10/09/97 |
| | | DATE ANALYZED ---> | 10/16/97 | 10/16/97 | 10/16/97 | 10/16/97 | 10/16/97 | 10/16/97 |
| | | MATRIX ----------> | Water | Water | Water | Water | Water | Water |
| | | UNITS ----------> | UG/L | UG/L | UG/L | UG/L | UG/L | UG/L |
| CAS # | Parameter | | 31176 | 31176 | 31176 | 31176 | 31176 | 31176 |
| 7439-92-1 | Lead (Pb) | | 252. | 0.9 U | 0.9 U | 0.9 U | 0.9 U | 7.1 |
| 7440-66-6 | Zinc (Zn) | | 9730. | 12.6 B | 5.8 U | 6.4 B | 29.5 | 7.9 B |

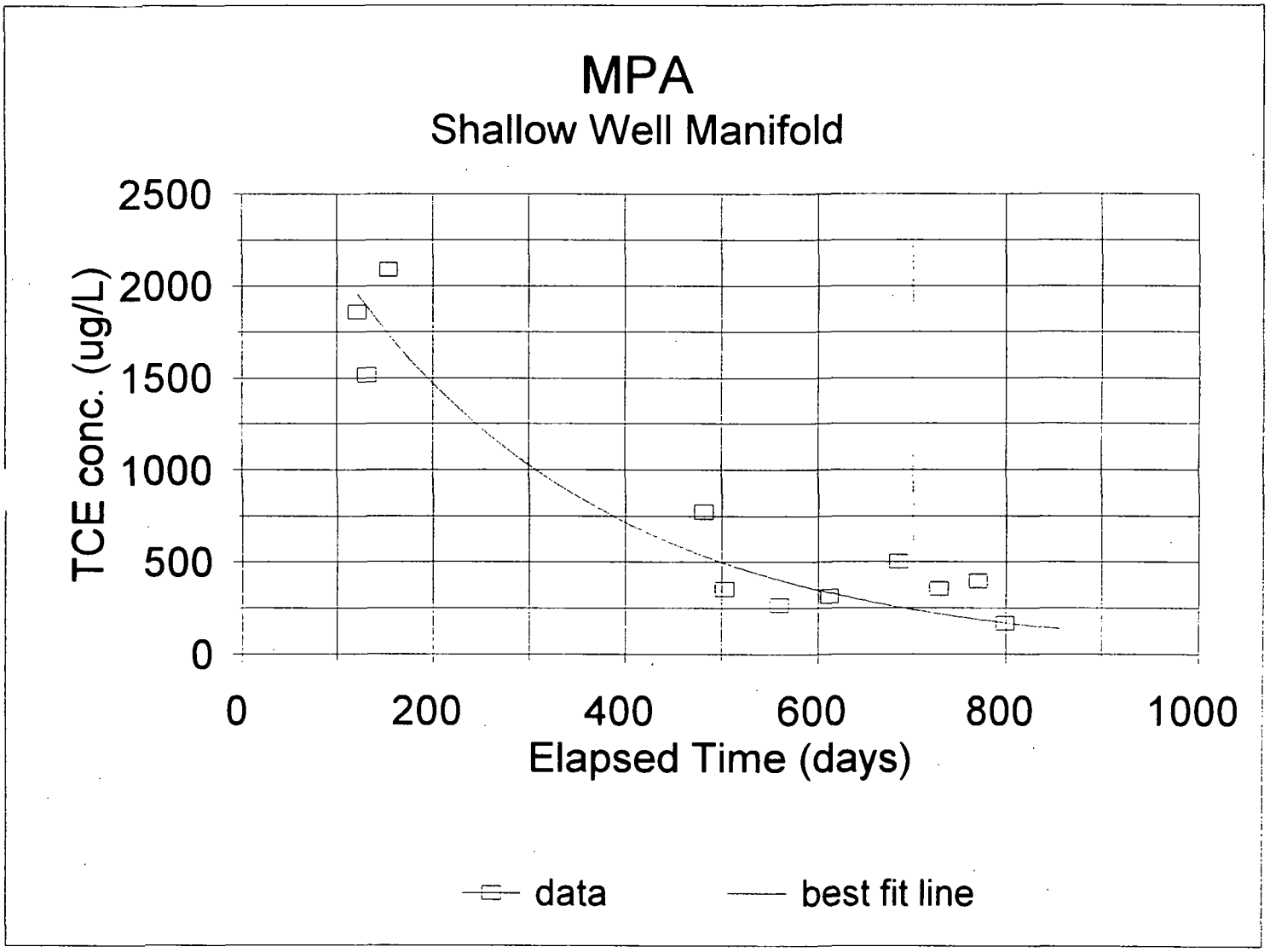
# CARRIER, COLLIERVILLE
## CARRIER, RD/RA MONITORING, 9/97

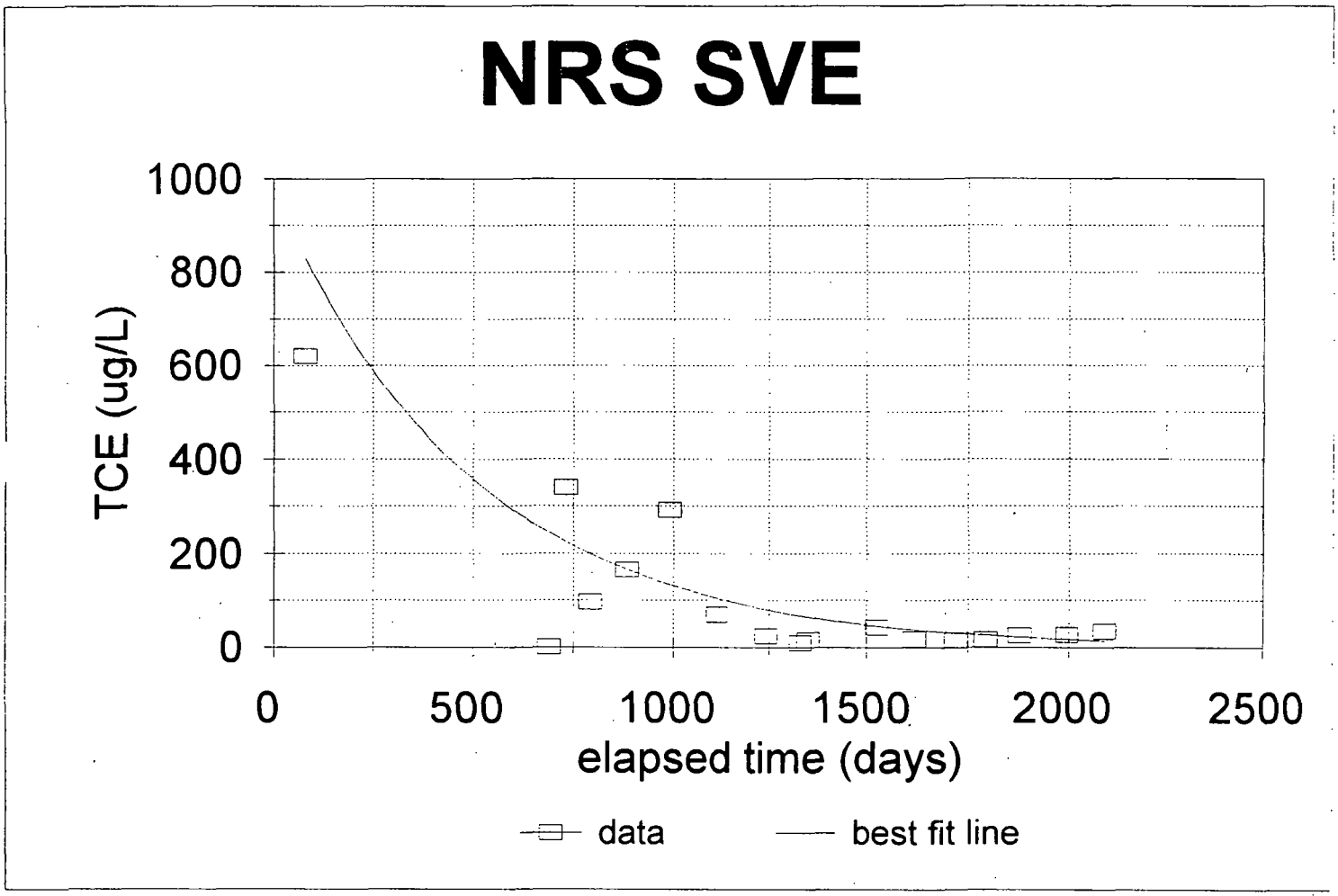


| METAL | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | SAMPLE ID -------> | CAR-G-WW09-97 | | CAR-H-WW09-97 | | | | | |
| | ORIGINAL ID -----> | CARGWW0997 | | CARHWW0997 | | | | | |
| | LAB SAMPLE ID ---> | 31176.06 | | 31176.10 | | | | | |
| | ID FROM REPORT --> | CARGWW0997 | | CARHWW0997 | | | | | |
| | SAMPLE DATE -----> | 09/24/97 | | 09/24/97 | | | | | |
| | DATE EXTRACTED --> | 10/09/97 | | 10/09/97 | | | | | |
| | DATE ANALYZED ---> | 10/16/97 | | 10/16/97 | | | | | |
| | MATRIX ----------> | Water | | Water | | | | | |
| | UNITS ----------> | UG/L | | UG/L | | | | | |
| CAS # | Parameter | 31176 | | 31176 | | | | | |
| 7439-92-1 | Lead (Pb) | 0.9 | U | 1.1 | B | | | | |
| 7440-66-6 | Zinc (Zn) | 9.7 | B | 32.2 | | | | | |

# APPENDIX B

# TCE REMOVAL CALCULATIONS


MPA
Shallow Well Manifold
TCE conc. (ug/L)
2500
2000
1500
1000
500
0
0
200
400
600
800
1000
Elapsed Time (days)
data
best fit line


NRS SVE
1000
800
600
400
200
0
TCE (ug/L)
0
500
1000
1500
2000
2500
elapsed time (days)
data
best fit line

**TCE Mass Calculations-Water Plant #2** 3rd Qtr 1997
**Carrier, Collierville, TN**

Assumptions:
1- Day 1 equals June 6, 1990-the completion date of air strippers at Water Plant #2.
2- City Well East & City Well West split the plant flow evenly
3- Concentration data from 1/4-ly sampling events

| | | | | |
|---|---|---|---|---|
| CWE Flowrate (gpm): | 375 avg. | Influent (ppb): | 94.0 avg. | (avg. of 2nd Qtr. 97/3rd Qtr. '97) |
| CWW Flowrate (gpm): | 375 avg. | Influent (ppb): | 186.0 avg. | (avg. of 2nd Qtr. 97/3rd Qtr. '97) |

**MATERIAL INPUT**

| | Flowrate (gpm) | Material Input (lbs. water/hr) | Material Input (lbs. water/day) | Material Input (lbs. water/yr) |
|---|---|---|---|---|
| CWE | 375 | 187,425 | 4,498,200 | 1,641,843,000 |
| CWW | 375 | 187,425 | 4,498,200 | 1,641,843,000 |
| Total | 750 | 374,850 | 8,996,400 | 3,283,686,000 |

**VOC REMOVAL RATES**

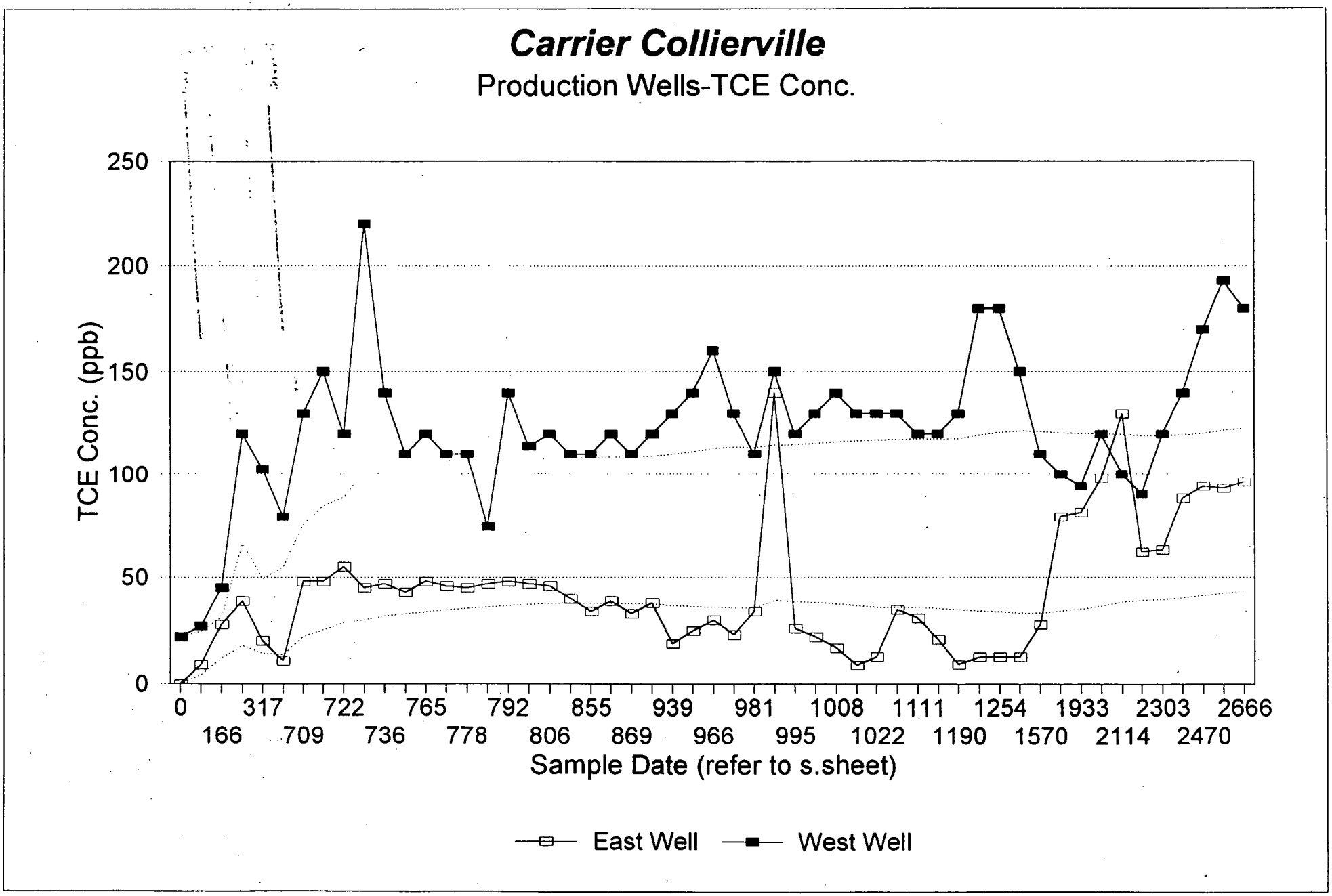
| | Influent (ppb) | VOC Removal Rate (lbs. VOCs/hr) | VOC Removal Rate (lbs. VOC/day) | VOC Removal Rate (lbs. VOCs/yr) |
|---|---|---|---|---|
| CWE | 94.00 | 0.0176 | 0.4232 | 154.46 |
| CWW | 186.00 | 0.0349 | 0.8374 | 305.64 |
| Total | | 0.0525 | 1.2606 | 460.10 |

| | | | | |
|---|---|---|---|---|
| **Operating time:** | **89** | **days** | for: | 3rd Qtr 1997 |
| **Total lbs. removed:** | **112** | **lbs.** | for: | 3rd Qtr 1997 |
| **Total Gallons of water treated:** | **96,120,000** | **gallons** | for: | 3rd Qtr 1997 |

Equations Used:

Material Input: [flow rate (gpm)] x [8.33(lb/gal) ] x [60(min/hr)]

Emission Rate: [influent(ppb)] x [ppm/1000ppb] x [(mg/l)/ppm] x [lb/454g] x [g/1000mg] x [3.785l/gal] x [60min/hr] x [flowrate(gpm)]


Carrier Collierville
Production Wells-TCE Conc.
TCE Conc. (ppb)
250
200
150
100
50
0
0
317
722
765
792
855
939
981
1008
1111
1254
1933
2303
2666
166
709
736
778
806
869
966
995
1022
1190
1570
2114
2470
Sample Date (refer to s.sheet)
East Well
West Well